PHYS 201 Fall 2019

Syllabus

- **Classical Thermodynamics**: Kinetic theory of gases, the concepts of heat and temperature, the gas laws, the First and Second Laws of Thermodynamics, heat engines, entropy.
- **Harmonic motion:** simple harmonic motion, complex numbers, damped simple harmonic motion, quality factor Q, driven harmonic oscillators, power input, resonance – *treatment based on that in French (on reserve), some discussion in Serway & Jewett*
- **Traveling Waves:** wave equation, transverse mechanical waves on a string, energy transport, characteristic impedence, superposition, transmission and reflection at boundaries, standing waves, wave groups, phase and group velocity
- **Electromagnetic waves in three dimensions:** Maxwell's equations in differential form, plane waves, wave equation for em waves, velocity of em waves, dispersion, extinction, energy transport by an em wave, Poynting's vector, momentum of an em wave, radiation pressure, generation of em waves. We consider in detail one specific em wave, light.
- **Propagation of light:** Huygen's principle, reflection and refraction, Snell's law, Fermat's principle, Stokes's relations, Fresnel's equations
- **Geometrical optics:** mirrors, prisms, lenses, optical systems, optical instruments, matrix methods in optics
- **Polarization:** linear polarization, circular polarization, angular momentum of an em wave, polarizers, retarders, quarter and half wave plates
- **Interference:** Young's double slit, thin film interference, wedge films, Newton's rings, Michelson interferometer, multiple beam interferometers, Fabry-Perot etalon
- **Diffraction:** Fraunhofer diffraction, diffraction gratings, Fresnel diffraction patterns, zone plates